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The Institute of British Foundrymen

The Institute of Vitreous Enamellers

The Welsh Engineers' and Founders' Association

The Foundry Trades' Equipment and Supplies Association

Institute of British Foundrymen

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The Jobbing Foundry

The continuation of war conditions has brought much work to the jobbing founder, and with it an increasing number of problems. Prices have been good, and funds have accumulated. His customers, usually firms working for the Service departments, are pressing him for greater and still greater deliveries. This he can only do by extending his shops, but should he use money standing to his credit at the bank, there is the certainty of being unable to meet the demands of the Excess Profits Tax. Which is the more important, extra production or loss of revenue? His next most pressing worry is the pressure brought to bear by the Ministry of Labour and National Service to utilise female labour. Trials have been made without success. In the jobbing foundry there is neither canteen nor even proper lavatory accommodation. Taking a shop employing twenty men, divided up as to three in the patternshop, one foreman, one brass melter, one cupola man, eight moulders, two core makers, and four fettlers and labourers, the jobbing foundry owner can but envisage the replacement of but two or three, and visualises that the alterations necessary for their comfortable employment would require so many man-hours in constructional work as to neutralise for many weeks any hypothetical advantages. If extensions could be permitted, however, the employment of women could be easily undertaken.

It is perhaps difficult for some to realise, but some jobbing foundry owners have never seen a modern mechanised foundry, and others, who have had that privilege, merely despise them. For two or more decades, some of the more articulate have wasted much time in publicly attacking the metallurgist. Suddenly, they have made a *volte face* and directed their venom against the repetition shop. This ridiculous attitude must be changed, as there is so much to be learnt by a thorough knowledge of each other's problems. For instance, at the moment both types of shop have the common urgent and insistent problem of making high-grade castings from high-phosphorus irons and some jobbing shops, perhaps through financial embarrassment during a depression, manage to make quite good high-duty irons using the cheapest materials. The accident of their production in no way detracts from their value, and the larger concerns would benefit from investigating their mixtures and methods. This problem of the fullest utilisation of high-phosphorus irons both deserves and demands the maximum of co-operative effort. The average jobbing foundry owner will readily confess his inability to institute a proper costing system. He believes he "knows" what he is doing, but with one clerk, whose whole time is taken up with the keeping of a ledger, a cash book, wages book, petty cash, and invoicing, there is little time left for industrial accountancy. His ambition is to solve a problem which will ensure a continuous flow of orders as a nucleus of his business, for he realises how many successful concerns have been built up on this basis. Whilst no metallurgist, the jobbing foundry owner has a profound respect for the advantages this science has bestowed on the industry, but he still regards the art of placing runners and risers as being the key to success. He has become impressed with the necessity for cleanliness in all moulding operations and would welcome the introduction of job cards carrying technical slogans to help him in his campaign. As this notion is equally applicable to the larger concerns, and is obviously in the national interest, we sincerely hope that the idea will be taken up in employers' federation circles.

Many jobbing foundry owners have not yet joined the I.N.C. or other employers' association for a variety of reasons. It appears to us an attractive inducement would be an offer of help on costing by the provision of actual books, together with simple instructions as to how to keep them. Obviously, such books and their writing up must be kept to the minimum, for the time available for their maintenance is strictly limited. There is a strong aversion to selling by weight, but custom of the trade still forces them to accept orders on this basis. Periodically, the jobbing foundry gets badly "stung" by the receipt of the most complicated patterns from which castings are to be made at the standard price. The time is surely ripe for employers' federations to issue an edict that, from now onwards, all quotations would be on the basis of per piece and not by hundredweight. After all, engineers sell their lifts, drilling machines, motors or compressors as such, so why should they require to purchase their components on a weight basis? Well-directed propaganda could eliminate most of this trouble, with much benefit to the jobbing foundries. The moment, because of the current mental outlook of the jobbing foundry owner, is propitious for interesting him in co-operative matters, and, if it is neglected, the industry will, as soon as anything like normal conditions return, suffer from all the evils to be associated with unrestricted price-cutting.

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Future of the Metal Exchange

BY "ONLOOKER"

At the recent annual meeting of the Metal Market and Exchange Company, Limited, the chairman had something to say both about the present and the future of the London Metal Exchange, his remarks being addressed as much to the authorities as to the shareholders, for he voiced the opinion that surely no government would follow a policy aimed at the permanent destruction of commodity exchanges. This question of dealing in "futures," whether copper, corn or cotton, has, of course, been debated at considerable length over a number of years, and much ink has been spilt in an endeavour to justify or confound the principles underlying the conduct of commodity markets. It has been contended that such centres of trading are unduly influenced by the professional gambler, who, it is claimed, is responsible for wide price fluctuations calculated to disturb trade and create a feeling of uncertainty. That speculation formed part of the make-up of the average commodity market in pre-war days can hardly be denied, and in this respect the London Metal Exchange cannot claim exemption, but the broad price trends on these markets were governed by the realities of the situation in terms of supply and demand.

What then do those who favour the maintenance of commodity exchanges claim for them? In what way do they serve the interests of the commercial community, whether capitalist or wage earner? Much might be written in reply to these questions, and in passing notice may be taken of the fact that in the speech mentioned above it was claimed the Metal Exchange had done much over a period of years to improve both domestic and international trade, but expressed in a very few words one can say that perhaps the chief function of the Exchange has been to promote price stability. In considering this claim it must be remembered that the London Metal Exchange was a free market, that is to say, both buyers and sellers of any quantity could satisfy their needs on any market day, and here it is well to bear in mind that there was an afternoon session as well as one at midday. Standard copper was the most important medium of trading on the Metal Exchange, but that is not to say that no dealings in electro took place. In the ordinary way, however, business was done on the basis of standard warrants, the official quotation for which appeared every day as "cash" and "three months." If a buyer therefore wanted to cover a sale of copper and did not wish to take delivery for some time, he could protect his position by buying 3 months standard, knowing very well that in due course he could change over to electro.

At the present time stability rules in all four metals normally dealt in on the Exchange, and the reason for that happy state of affairs is Government control. Through the Control at Rugby the Ministry of Supply, having first concluded purchase agreements with producers and holders of various metals, sells to consumers against licence, and in due course delivers in fulfilment of the contract. In effect the war machine holds the metals and sees to it that they are utilised only to maintain and develop the successful running of the machine. Overseas suppliers in our Dominions and elsewhere have agreed to this course for the duration of the war, but it is doubtful if they would be happy about it in times of peace, even though the British Government wished to continue to act as middleman. As a stabilising force and medium for hedging against market risks it would seem therefore that the Metal Exchange will once again open its doors in that post-war world, the outlines of which we as yet see only very dimly.

Council of Ironfoundry Associations Meeting at Leeds

A meeting of the Council of Ironfoundry Associations was held at Leeds on March 11. Nineteen members, representing fourteen Associations, were present, Mr. FitzHerbert Wright (Chairman) presiding. Following Mr. W. R. Blair's resignation on his accepting the appointment of Independent Chairman of the Scottish Coal Sales Advisory Committee, Mr. J. Galbraith Sneddon has become the representative of the B.I.A. on the Council, and Mr. W. H. Rennie has replaced Mr. Blair as representative of the Greensand Pipe Founders' Association of Scotland. The Council elected Mr. W. H. Rennie as Vice-Chairman and member of the Executive and Finance Committee to take the place left vacant by Mr. Blair. Major R. Miles, president of the Institute of British Foundrymen, was co-opted as a member of the Executive and Finance Committee.

Among matters discussed by the Council were: Price control, absenteeism, workers' extra clothing coupons, demurrage charges, woman labour, and the conservation of fuel. The report of the Council's Technical Committee was read by the Secretary, on behalf of Dr. H. Hartley, Chairman of the Committee. The report dealt with problems that are being investigated by the Technical Committee, and with its prospective activities.

Notes from the Branches

London.—The Annual General Meeting will be held in the evening of April 30 at the National Liberal Club. It will be followed by the first meeting of the London Foundry Brains Trust. Invitations are being sent to recognised authorities to help in the discussions. Questions from members of the Institute located in any part of the country will be welcomed. Postcards should be addressed to Mr. V. C. Faulkner, 3, Amersham Road, High Wycombe, Bucks. The May meeting (probably May 28) is to be addressed by Mr. D. Cherry Paterson, M.I.Mech.E., his subject being foundry mechanisation. The June meeting (probably June 25) is provisionally reserved for a lecture by Mr. J. H. Williams, B.Sc., on the subject of ladle metallurgy.

Catalogues Received

Molybdenum in Steel. Very opportunely the Climax Molybdenum Company of Europe, Limited, 213, Crosby Square, London, E.C.3, have brought out a revised edition of "Molybdenum in Steel." No textbook is available which has such up-to-the-minute information as this latest publication, which is invaluable to both the engineer and steelmaker.

Novel Thermometry. J. M. Steel & Company, Limited, of Kern House, 36/38, Kingsway, London, W.C.2, have sent us details of a very interesting development in temperature control. A series of paints have been made available which on reaching a definite temperature abruptly change from one colour to another. Thus a continuous reading is not available but rather a series of points, ranging from 80 deg. C. to 800. The system known as Thermadex is illustrated by a colour chart and if it be really representative of practice some of the changes illustrated, especially 155 deg. C. (E91) and 235 deg. C. (E104), are remarkably clear cut. The higher range is not particularly well catered for, as there is a gap still to be filled between 625 and 800 deg. C. As 40 temperatures have been established, the usefulness of the system is unquestionable.

Random Shots

The following letter, written in 190[illegible], was obviously a product of pre-coupon days. Now-a-days a pair of pants is a pair of pants, and four solid coupons' worth withal. Even a Plymouth Brother or a Jehovah's Witness would appreciate the cosiness of a bit of Wolsey next the skin, and would not hesitate to draw on a pair of Cardinals on a bleak and snowy morn; but here's the letter:—

"Dear Sirs,—I am sorry to return the drawers, which are a trifle too small round the waist. At the expense of being considered bigoted, to tell you the truth, I do not like the Brand, although the material is excellent in quality. The man whose likeness appears, 'Wolsey,' was one under whom poor Protestants *writhed*, and although you may say this is a small matter and of no importance, it indicates the Firm at least allowing such to go forth in these critical times is at least careless, if not genuine Roman Catholics, and a feather will indicate which way the wind blows. Again, the buttons would be better of linen instead of pearl. Please send me others."

* * *

Incidentally, the story goes that the name "Wolsey" was chosen as a trade name for woolly underwear as a result of a sudden brain-wave of a director at a board meeting of the manufacturing firm. The meeting was called to find a name for the new "line," and after a harassed half-hour's sitting which produced nothing, one of the directors left his seat and gazed out of the window, as if to gain fresh inspiration from the life and movement in the street outside. Sure enough, the inspiration came. The scene on to which he gazed was a park which contained the ruins of Leicester Abbey, where Cardinal Wolsey spent his closing days after his downfall.

* * *

It appears that the shortage of any labour not directly concerned with war production is causing an acute situation in the Bright Homes of Britain, for housewives are everywhere complaining that they cannot get their windows cleaned. To attempt to clean the outside of the windows of many houses, one has to be somewhat of a contortionist and certainly not subject to attacks of vertigo. As a point to be considered in post-war reconstruction, is it too much to hope that the inaccessibility of windows be abolished for ever? It seems a simple enough piece of engineering to arrange that they swing round on a central pivot, so that they can be turned inside out, so to speak; or merely to follow the Continental plan of making them open inwards instead of out.

* * *

For those whose leisure moments incline more to erudite occupations, such as solving crossword puzzles or answering examination papers, here is an unusual "quiz." It is composed entirely of abbreviations from the Oxford Dictionary, and for the benefit of those who are not lucky enough to possess that gigantic but fascinating work, the answers will be given next week. The abbreviations chosen are:—Cryst (all); e. midl.; Jam; M.Sc.; N.O.; pron: *pron*; S.A.

* * *

A youngster, who is of an enquiring turn of mind, wants to know if they keep a person permanently ill at Kew in order to test all the thermometers they make? Also, if he inadvertently gets better, do they rush him off to a diphtheria camp to make him ill again?

"MARKSMAN."

The Shell Container for a 4.5 Anti-Aircraft Quick-Firing Gun is made from 22 lbs. of Waste Paper and that for a 3.7 Gun from 10½ lbs.

The Manufacture, Specification, and Use of Phosphoric High-Duty Irons

At a meeting of the Lancashire Branch of the Institute of British Foundrymen, held at the Engineers' Club, Manchester, on January 10, over which Mr. W. Holland presided, and at which there was a very large attendance of members, an address bearing the above title was given by Mr. J. G. Pearce, M.Sc., F.Inst.P., M.I.E.E., M.I.Mech.E., Director of the British Cast Iron Research Association. Mr. Pearce was accompanied by Mr. Thomas Tyrie, B.Sc., Superintendent of the Scottish Laboratories of the Association. Much of the information contained in Mr. Pearce's address appears in a report made by Mr. Pearce to the Institution of Mechanical Engineers, which was published in the FOUNDRY TRADE JOURNAL of August 14, 1941, page 105. Mr. Tyrie also addressed the meeting, and exhibited a number of lantern slides of castings chosen to illustrate the Paper.

Vote of Thanks

MR. A. PHILLIPS (Manchester) proposed that a hearty vote of thanks be accorded to the two speakers for their extremely interesting communications. Members would certainly agree with all that had been said concerning the importance of utilising all the iron which was available at the present time. It was obvious that cast iron was coming into its own again, and full advantage should be taken of that fact. Owing to a shortage of non-ferrous materials the Ministry of Supply was now asking foundrymen to turn over to higher grade cast irons, and the information collected by Mr. Pearce would certainly prove of great assistance in helping to solve some of the problems connected with its use.

Mr. Tyrie had dealt with some of the problems connected with small castings, and doubtless the members would have liked Mr. Pearce to have elaborated some of the aspects of what was termed, in foundry language, the life of cast iron or its flowability. The use of phosphoric high strength cast irons was quite an old practice in Lancashire, and, in the case of a large number of foundries, light castings were made, and out of the same cupola were produced, in some instances, up to Grade 2 metal in sections seven-sixteenths in. thick.

MR. E. LONGDEN (Manchester) seconded the vote of thanks, and mentioned that Mr. Pearce was carrying on a great deal of work for the general increase in the use of cast iron. The forceful, lucid way in which Mr. Pearce had presented the subject-matter of his address concerning the general cast iron field was particularly impressive. Even as far back as 20 years ago the possibility of developments in the use of cast iron had been under consideration. The British Cast Iron Research Association had been steadily plodding on with its research work, and the results which had been achieved were now quite appreciable. He would like Mr. Pearce to state what he considered to be a really high phosphoric cast iron. They had been told that other elements in cast iron, particularly carbon and silicon, had a considerable bearing upon the structure of the metal, and Mr. Pearce had stressed the point that structure was important. As long as the necessary structure was obtained, the analysis might follow from a personal standpoint. The clear lines which had been laid down by Mr. Pearce, particularly with his graphs, appeared to show almost an exact melting or mixing procedure.

The vote of thanks was carried by acclamation.

Importance of Specifications

MR. PEARCE, in responding to the vote of thanks, thought that no one ever came to speak in Lancashire without feeling he was coming to teach his grandmother how to suck eggs! Therefore, he hoped the members would bear with himself and Mr. Tyrie in having the presumption to come and address them at all! Lancashire was one of the livest and most up-to-date areas in which the foundry trade was practised, as well as being one of the most important and turning out the most varied products.

The special feature connected with the present state of affairs related to the necessity for bringing into engineering production foundries which had not found it necessary hitherto to concentrate in that direction, as well as the added importance attaching to specifications in foundry practice. Government officials generally attached considerable importance to specifications and the establishment of standards such as Grade A or Grade 2, and this tendency should be encouraged, because it was certainly a help to the foundryman. Specifications had been of enormous advantage to the trade at the present juncture.

The Vogue for Low Phosphorus

It was necessary to give foundrymen generally some idea as to the national position arising out of which the use of high phosphoric irons was made necessary. Mr. Phillips said this had been done to a considerable extent previously, and the statement was correct to a very large degree; perhaps more correct in Lancashire than in other areas. Nevertheless, it was not correct of the country as a whole. On the contrary, for the last 10 years there had been quite strong influences at work tending more and more to diminish the amount of phosphorus used in engineering irons. This probably originated in the motor-vehicle industry, which was regarding the matter from one particular angle. The castings used in that industry were comparatively small and comparatively thin, and most of them had a high silicon content. Therefore, as shown in the Paper, a high phosphorus content could not be used. A low phosphorus content must be the rule here for soundness, and people making heavier castings followed the same course without realising that with lower silicon a higher phosphorus was practicable.

For good or ill—Mr. Pearce thought for good—practice in this country was profoundly influenced by that in the United States. Branch factories had been established in this country which were visited by British foundrymen, who came away from them having formed ideas which were very wise and very sound. How many people, however, realised, when they spoke about American mixtures and compositions, that it was a difficult matter to get a phosphorus content in the United States of more than 0.3 or 0.4 per cent.? To some extent the American foundrymen were handicapped by the use of low phosphorus materials. For this, and other reasons, a position had been reached before the war in which it might be said that phosphorus was unfashionable in this country. Lancashire might have had the courage of its convictions and used a high phosphorus content. It was necessary, under present national conditions, to say that the industry must use phosphorus to the greatest extent consistent with soundness.

Comparative Flowability

There was no doubt that the life or flowability of the phosphoric iron was higher than that of a low-phosphorus iron. Phosphorus, carbon and silicon added considerably to the capacity of the metal to take the shape of the mould, and to run a long distance without freezing. The lower the phosphorus, carbon and silicon contents, the less this became possible; and this effect could only be dealt with by increased temperature of melting. This was why stress was laid upon getting higher temperatures from the cupola in the first place.

Mr. Longden had raised an awkward question. What was a high phosphorus iron? There was no final answer to the question. Prior to the war, 1.2 to 1.4 would have been regarded as the highest commercial limit. In other words, this was the highest phosphorus content, to be got by melting phosphoric pig-iron and phosphoric scrap. To-day, figures of 1.6 and 1.8, and, for basic pig of 1.2 per cent., were by no means uncommon.

From the diagrams of what might be referred to as the maximum limit for phosphorus for the different grades of B.S.I. specifications, the material was something of the order of 1 per cent. or 1.2 per cent. The diagrams did not refer to Grade C, but it could be reached just outside the region for Grade A, which could be got up to 1.2 per cent. without much difficulty.

Scottish Practice

MR. TYRIE observed that in Scotland there were foundries which were making use of high phosphoric irons and low phosphoric iron mixtures on the same day. Quite a number of foundries were running probably three or four different mixtures per day, but the difficulty appeared to be in having suitable work to take the change-over metal between one class of iron and the other. Unfortunately, in many foundries, they did not have that advantage. There was a more or less strict line of demarcation between the truly light casting and the engineering casting, and that was how the difficulty arose. It was largely in order to overcome that difficulty, as well as to meet present conditions, that an attempt to use an iron containing up to 1 per cent. of phosphorus had been made, and had been made with success, in the production of lighter engineering castings.

He had been asked what was actually the specification required for these castings. Some of them were above Grade A. The particular castings illustrated were Grade A, but all of them were made from metal containing a high phosphorus content except the air-compressor cylinder castings; these component parts were cast from a mixture containing from 1.6 to 1.8 per cent. of silicon with 0.6 per cent. phosphorus. All the other castings were from metal round about 2 per cent. silicon and with phosphorus contents of 1.0 to 1.2 per cent.

High Phosphoric Grade 2 Castings

MR. A. PHILLIPS said there were Lancashire foundries which were melting from three Derby pig-irons. That type of pig-iron carried high phosphorus content, but they were not making any other castings, except now and again, and then it was said: "We will have them Grade 2, seven-eighths thick." That was what he wished to point out. Mr. Pearce was speaking about two different things by introducing mixtures. This had been done for years. The day's blow was started off with common iron, and every now and again, due to the tackle used in commercial shops, castings were run somewhat similar to what had been shown, but they were run in Grade 2 iron, and out of the same cupola. This was what he, the speaker, had been talking about; the utilisation of phosphoric irons in a particular way. One particular place had made 300 tons of Grade 2 cast iron, while at the same time they had been running a high phosphoric iron from the same cupola. They insisted on Grade 2, and they ran Grade 2.

MR. PEARCE: How does Mr. Phillips explain the difference?

MR. PHILLIPS said there were several ways in which it could be done. There were additions made to ladles, as well as other practices. It was common practice to add something to ladles. He only wished to make a clear statement on the point.

Phosphoric High-Duty Irons

Cupola Practice

MR. A. L. KEY (Manchester) said that two statements had been made during the course of the address, one of which he could not reconcile with what appeared to be fact, while in the case of the other, there seemed to be an omission. Apparently the primary object of one statement was that the fundamental of good melting was the proportional relationship of tuyere area, and the sectional area of the melting zone of the cupola. He agreed with that statement up to a point, but he did not think that was the fundamental. Two cupolas could be running with precisely the same type of tuyeres, with the same internal diameter, but with a different medium of blowing being used which would affect the process almost to the two extremes. Speaking from his own experience, he was prepared to state that the fundamental of melting in regard to the life or flowability of the iron was determined by the method, and also the quantity, with which the air was introduced into the cupola.

The second point was with regard to pouring castings at 1,250 deg. C. He was visualising the case of the foundry with which he was himself associated, where they had a bowl ladle in front of the spout, tapping out with the idea of getting a perfect mixture, which was reasonably attained. The metal had to go to various parts of the foundry, mainly by shanking. How could the temperature be controlled within 20 deg. in such conditions? As he understood the statement, a difference of 20 deg. up or down made all the difference between success or failure. Was a pyrometer used on each shank of metal which was poured? What was the temperature of the metal in the receiving ladle as it came from the hearth or straight from the cupola?—or was the foundryman expected to use his own judgment based on vision?

MR. PEARCE said he had been putting forward the possibilities within the scope of the general manager to change if he was dissatisfied with the furnace. He agreed that blowing was fundamental in importance, but, when faced with an immediate demand for production from the furnace, the foundryman had to carry on with what blowing equipment he possessed. The blowing was certainly basic to the success of the operation.

MR. TYRIE, dealing with the point concerning temperature control, said that in the particular case in question the metal was tapped at the cupola at a temperature varying on different days between 1,300 and 1,350 deg. C., as indicated by a Cambridge optical pyrometer. The metal was taken down the shop by means of 10-cwt. bogies, and poured into the shanks. The pyrometer was then directed on the shank, and time was allowed for the metal to drop to 1,250 deg. C. Each shank was tested.

Cast Iron with Elongation?

MR. A. PHILLIPS then referred to the question of producing cast iron with a modicum of elongation. As had been remarked, they were all indebted to the British Cast Iron Research Association for the efforts they had made to bring cast iron into more prominent use, efforts which had borne fruit not merely in this country, but also even more in America. If these efforts had not been made, the majority of engineers would have treated cast iron as being the next stage after wood. Upon a former occasion Mr. Pearce had told him (the speaker) that experiments were being carried out on metal suitable for the making of castings, which did not require any subsequent treatment, but which would give a little elongation. This was a problem which had to be solved very frequently. Engineers required to change material nowadays. Certain types of material had to be conserved, and there was always trouble with regard to elongation when changing over, no matter what the type of cast iron might be, even up to Grade 4. Had anything been done with respect to the solution of this problem?

Lancashire foundrymen had never been stampeded by the phosphorus bogey, although an attempt had been made to stampede the whole country with it. It was found that by using irons with a low phosphorus content, there was invariably difficulty in obtaining a satisfactory casting. A higher phosphorus content was tried, and then the other elements were changed, such as the silicon and carbon, for strength. Better castings were thus always obtained, and there were less scrappers than was the case when using low phosphoric irons.

Graphite Control

He was sure Mr. Pearce would agree with him when he stated that in ordinary initially straight cast irons, structure played an important part in the ultimate strength, just as much as did chemical composition. In hundreds of cases irons of similar composition had been obtained, and yet totally different strengths resulted.

A remark had been made concerning the use of a large amount of hematite. It was more a matter of the nature of the formation of the graphite. The controlling of the shape of the graphite was one of the controlling factors in the strength of cast iron; not the total graphite, but its shape. This was a matter which involved a considerable amount of investigation with regard to micro-structure; but if a suitable shape could be determined, then it would be practicable to use high phosphoric irons. It would be possible then to run a cupola all day, and then pour a good casting of Grade 2 out of a common iron. It was a matter of the control of the shape of the graphite and nothing else.

Fundamental Factors

MR. PEARCE said that one way in which to make elongatable iron was to convert it into steel, while another was to make it into malleable iron or austenitic iron. It could be done whenever necessary. To get elongation with ordinary iron in the as-cast state was to ask for a great deal. Irons were spoken of nowadays as having a pearlitic structure. How much elongation did Mr. Phillips expect from a pearlitic steel—in other words, a pure iron-carbon material with no free graphite in it at all, which was the initial base material?

One way of getting some elongation would be not to malleablise the material, but to anneal it; to change the pearlite into ferrite, which caused the metal matrix to correspond with wrought iron or very mild steel. It was just pure iron with nothing but graphite. Then the metal would be in its most ductile and most elongable form, and the only reason why it was not as ductile as wrought iron or mild steel was owing to the presence of the graphite itself.

This was an old subject of controversy between himself and Mr. Phillips, and he wondered whether they were wise in telling engineers they could not have a ductile cast iron, yet to some extent, he thought, they already had it.

His idea for using cast iron, in design, was to treat the breaking point of cast iron precisely as the yield-point in steel was treated; the point beyond which the material was of no further use. Up to that point, in the case of cast iron, there was a measure of elongation which many people in the industry, even to-day, were not prepared to admit. They still talked, and acted, and led engineers to think that cast iron was a brittle material when, strictly speaking, this was not the case. For most engineering purposes it was not necessary to have, say, 30 per cent. elongation; even 1 per cent. would provide the slight amount of yield prior to failure, which was all the engineer desired.

A Suggestion for Propaganda

There were various patent specifications and developments appearing from time to time, but from the metallurgical point of view, while maintaining a completely open mind upon the subject, he could not express any hope of a cast iron being produced straight from the mould which had anything like the ductility expected in the case of steel. He would much rather approach the matter from another angle, and say to engineers: "You are wrong in designing on elongation." Most things to-day were used in motion, under conditions of fatigue, of repeated stress, in which elongation was not a factor of importance. Steel would fracture under those conditions, just as if it were cast iron, with what was termed a notch type of failure. The start of failure was some small irregularity or a slight crack which spread over the whole structure.

Thousands of cast-iron crankshafts were being made and used at the present day, and were giving every satisfaction to their users and to assemblers; yet what type of casting could there be which, in ordinary engineering parlance, more needed ductility and elongation for the purpose it had to serve? Therefore, it was better not to strain after the achievement of an elongation which was difficult to attain, but rather to ask whether that elongation was necessary.

(To be continued.)

British and American Specifications for Non-ferrous Metals

With the increasing numbers of specifications for non-ferrous metals, both in the general engineering series and in the aircraft series, there has been an increasing demand for some form of publication which would give in summarised form the details of the various specifications. At the present time anyone requiring a specification for a particular material can only ascertain whether an existing specification will cover the type of material he has in mind by consulting a number of individual standards, and if these are not immediately available, as in most cases they are not, he is left to guess.

The need for a summary of the various specifications has, therefore, been stressed frequently. This need has now been met by the issue by the British Standards Institution of a survey which not only summarises the specifications in this country, but also gives details of the corresponding specifications in America. The document covers the specifications in the general engineering series, the British Standard aircraft series and the D.T.D. series, also the specifications of the American Societies of Testing Materials, the Society of Automotive Engineers, the Federal specifications and those in the new series for aircraft purposes called the Aeronautical Material Specifications in America. The summary includes 35 tables for aluminium and aluminium alloys, copper, copper alloys, nickel and nickel copper alloys, lead, tin and zinc. It covers all forms of metal, *e.g.*, sheets, bars, rods, ingots, castings, wire, etc. The summary will be invaluable to all manufacturers and users of these materials.

Copies of this B.S. 1007 may be obtained from the British Standards Institution, 28, Victoria Street, London, S.W.1, price 10s. 6d. (11s. post free).

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(*Concluded from page* 197.)

minium-Archiv, Nickel-Berichte, Autogene Metallbearbeitung, Elektroschweissung, Elektroschweisser.

France.—Revue de Métallurgie, Cuivre et Laiton, Métaux, Métaux et Corrosion, Revue Aluminium, Bulletin de la Société des Ingénieurs Soudeurs, Revue de la Soudure autogene, Journées de la Lutte contre la Corrosion.

U.S.S.R.—Stal, Metallurg, Kachestvennaya Stal, Vestnik Metallopromyshlennosti, Ogneupori, Zvet. Metally, Koks i Chimiya.

Other Countries.—Of the many periodicals published in the lesser iron and steel producing countries, mention must be made of Jernkontorets Annaler, the leading Swedish journal, which contains the records of the pioneer contributions of the Swedish metallurgists. Metallurgia italiana and La Fonderia appear in Italy.

Metallurgical Literature

ITS CO-ORDINATION AND DIFFUSION

By E. R. FRANCIS, B.Sc. Hons. (Lond.), B.Sc. (Lond.), A.L.A.†

(*Continued from page* 179.)

APPROXIMATE VOLUME OF PERIODICALS AND PAPERS

As to be expected, the above analysis of the principal abstracting media in the metallurgical field furnishes no clear-cut figures of the number of periodicals carrying metallurgical Papers or of the approximate number of annual contributions to the literature. Of the bodies which cover the entire field more or less thoroughly, the Iron and Steel Institute, the Institute of Metals, and "Stahl und Eisen"—"Die Giesserei" is omitted, as it specialises in foundry practice, although in a wide metallurgical sense—each scans and abstracts between 200 and 250 periodicals, which may be assumed to contain all the more important and original contributions to the literature of pure and applied metallurgy.

In contrast, "Metals and Alloys" to implement its programme of an exhaustive survey of the metallurgical literature scanned 800 periodical publications annually for five years, some of which must obviously have been of restricted value with a very low yield of contributions coming within the scope of the abstracts. The barrenness of some of the periodicals scanned by "Metals and Alloys" is shown by taking the average yield factor, *i.e.*, the number of abstracts and references divided by the number of periodicals scanned. In 1935, this factor was about 6.5 for "Metals and Alloys" and about 9 for the Iron and Steel Institute's abstracts, whose selection has clearly been on a more catholic basis. In only one year, 1934, did the "Metals and Alloys" factor exceed 10, while both the Iron and Steel Institute and the Institute of Metals have registered factors around the ten level for some years past, the Institute of Metals even reaching around 15 in 1937 and 1938. In 1940, the "Stahl und Eisen" factor was above 10, but the total abstracts included many book notices.

No precise quantitative conclusion should, however, be drawn from these figures, beyond the essentially qualitative one that many of the periodicals scanned by "Metals and Alloys" in its period of maximum activity must have given such a low yield, that their regular inspection could have been dispensed with, without any omission of important literature and consequent loss in the service rendered to the metallurgist. Its total of 800 periodicals is obviously too high for the full number of technical periodicals carrying the essential metallurgical literature. It would appear that about 300 to 350 periodicals represents the first line in the field under review, with the possible addition of about 150 units in the second line.

Number of Papers

To arrive at the approximate number of Papers contained in the literature each year, new difficulties arise inherent in the extreme miscellaneous nature of the technical literature and in the angle of approach. A contribution to the metallurgical literature may vary in character between such wide extremes as Hume-Rothery's work on the lattice structure of alloys or research on spectrochemical analysis, and the description of a bar mill or a new patented product for sealing porous castings; in a separate class, falls the wide range of publicity and trade literature, a common feature of the American periodicals. All these contributions have a proper metallurgical interest in some sense or other, but it is questionable whether they need all be noticed by bibliographical or abstracting bodies. Moreover, a *complete* survey demands a large organisation and entails a heavy expenditure. A catholicity in selecting Papers and articles for inclusion in periodical abstracts thus becomes imperative, and was eventually adopted also by "Metals and Alloys" after an attempt to produce an omnibus review of the metallurgical literature. The original policy, as seen above, furnished nearly 8,300 abstracts and notices in 1934; with more restraint in selection a gradual contraction in numbers took place to the present level of 600 abstracts per annum.

On the other hand, the two British and one German abstracting bodies covering ferrous and non-ferrous metallugy from different angles, have always shown a greater selectivity and include only references to original work and good critical reviews, eschewing trade literature and semi-publicity matter. "Stahl und Eisen" includes works descriptions and many industrial aspects. Their annual yield has been, in consequence, in the more modest range of 2,000 to 3,500 abstracts and notices per annum. It is obvious that a selective list of abstracts and references, small in number, is more useful than a very large number which, although exhaustive, contains much chaff to be winnowed out by the reader, an operation which should have been done by the abstracting organisation. Nevertheless, different workers require different fields to be covered, and abstracting services should, therefore, be complementary to each other and not overlap, except at the unavoidable borderlines. Narrow fields covered exhaustively have more to recommend them than a wide field covered very incompletely.

Estimate for Recent Years

From the point of view of pure and applied metallurgy, the selective policies of the Iron and Steel Institute and the Institute of Metals appear to furnish a reliable and representative review of the scientific and technical literature. Their abstracts, which overlap to some extent, are a better guide to the approximate number of original and important Papers published in the metallurgical field each year, rather than the more variable and, over a period of years, much larger number listed by "Metals and Alloys." On their basis it may be computed that a figure between 3,500 and 4,500 probably represents the annual output of important contributions to the metallurgical literature during recent years. It can also be assumed that, as soon as normal conditions are restored and the free publication of metallurgical work becomes possible, the annual figure will be closer to the upper limit of this range, in view of the vast expansion in research in many new directions which has arisen out of war needs.

SPECIALISED BIBLIOGRAPHIES IN METALLURGY

Even with the aid of good author and subject indices, it is frequently very laborious to extract references from the annual volumes of abstracts relating to a specialised subject over a period of years. When they become too numerous the periodical abstracts seem to serve their primary purpose of affording a succinct review of current literature better than their secondary purpose of providing a record of past work. A further stage in the co-ordination of technical literature is, therefore, represented by specialised bibliographies with abstracts covering the literature in a particular field over a number of years. It would appear that these compilations, presenting in a most assimilable form the contents of a large number of Papers, with the omission of all matter extraneous to the particular subject under review, should be more fully exploited in the light of the present volume and diversity of the literature published annually, and the high probability that a substantial expansion of the periodical literature must be expected in the post-war years. The technical societies, which alone command the knowledge, facilities and experience to carry out the compilation and publication of these specialised bibliographies, might give the subject closer consideration.

Iron and Steel Institute Bibliographies

Examples of such bibliographies in the metallurgical field are the Bibliographical Series issued by the Iron and Steel Institute. Nine parts in this series have been issued since 1936, when No. 1 on the fluidity and viscosity of metals appeared. This bibliography contained 60 references, the majority with abstracts, to Papers published in the period 1902 to 1935. Nos. 2 and 3 on certain physical constants of iron and steel (95 Papers covering 1930 to 1935) and on the design, manufacture, properties and use of ingot moulds for steel ingots (94 Papers covering 1899 to 1935), also appeared in 1936. No. 4 (1937) gives abstracts of 85 Papers on the influence of arsenic and tin on the properties of iron and steel, in the period 1864 to 1936 for arsenic and 1901 to 1936 for tin. No. 5 is a bibliography on the manufacture, properties and testing of steel castings, with 660 references in the period 1920 to 1937, an average of 39 per annum. No. 6 is a bibliography on gas-producer practice, with 379 entries for the period 1902 to 1936. No. 7, with 118 Papers on flakes and fissures in steel, covers the period 1918 to 1937. No. 8 is a bibliography on the physical chemistry of the open-hearth process covering the period 1920 to 1937 (275 references). No. 9 published in 1941 contains 250 references and abstracts on grain size in steel and its effect on magnetic properties.

The style and arrangement of these bibliographies have been steadily improved, the abstracts now being in the same form as in the monthly Journal of the Institute. Apart from a subject index in No. 9 and a name index in No. 6, no other indices are provided in the other members of the series. Nevertheless, each compresses into a very convenient compass a chronological list of abstracts of the important literature in its particular subject. An examination of bibliography No. 5 on steel castings, where the abstracts are further classified in 12 sections, shows that, of the 660 entries, 335 originated from the United States (including less than five from Canada), 203 from Great Britain, 80 from Germany and 35 from France. A comparison of these figures, which cover nearly the whole of the post-war period of 1920 to 1937, throws interesting light on the relative volume of published research in the principal steel-making countries, in so far as steel castings are concerned. No. 9 on grain size covers the whole period from the original McQuaid-Ehn observations in 1922, and indicates that, while the principal work has understandably been done in the United States, accounting for 146 contributions out of the total of 250 listed, Russia and Poland occupy second place with 37 Papers, with Great Britain and Germany following with 28 Papers each. Growing activity in metallurgical research in Russia and Poland is indicated by these figures.

Spectrochemical Analysis

The range of bibliographies on spectrochemical analysis also provide interesting examples. The second edition (1940) of the Bibliography

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of Spectrochemical Analysis compiled by D. M. Smith, and issued by the British Non-Ferrous Metals Research Association, contains 510 references, most with short explanatory notes, classified under 10 main heads, covering the period up to August, 1940. An author index is provided, and Papers containing bibliographies of the early work are indicated, thus much expanding the bibliographical range. In 1938, F. Twyman, of Adam Hilger, issued Spectrochemical Abstracts, 1933-37, giving 228 abstracts in an author index with full bibliographical data and a subject index classified under 15 heads, with the abstracts proper and cross-references to the author index; eleven books on spectrum analysis published between 1931-37 were also given. A second edition, 1938-39, published in February, 1941, and compiled by E. H. S. van Someren, added a further 166 references.

Covering the same field, in January, 1939, W. F. Meggers and B. F. Scribner, as a result of work sponsored by the A.S.T.M., issued an Index to the Literature on Spectrochemical Analysis, 1920-37, which included 900 references to Papers, books and reviews. A second edition, issued last autumn, contained 1,467 references. The arrangement is chronological and alphabetical by authors. While these four publications are of the greatest value to the worker in the spectrochemical field and offer good introductions to other workers, the feeling is inescapable that much patient work has been triplicated, and that an internationally co-ordinated bibliography would have saved both time and money.

Non-metallic Inclusions and Corrosion

Another important contribution is the "Bibliography of Non-Metallic Inclusions in Iron and Steel," by L. F. McCombs and M. Schrero, published by the Mining and Metallurgical Advisory Boards in 1935, which contains 2,136 references covering 308 pages. Reviewing this work, a reviewer calls attention to the fact "that every item in the list has been examined and checked, a practice which is not at all general in the compilation of bibliographies, as those who have much occasion to use them know only too well. Where possible, the reference is to the original publication, followed by references to reprints, translations or abstracts found elsewhere. Brief annotations are added in every case, not to serve the function of abstracts, but to help the user of the bibliography to decide whether it is worth while for him to consult the original. The references are arranged in alphabetical order of the authors' names, no classification having been attempted, but a most excellent index at the end supplies any need there may be for a suitable classification. Research workers concerned with the study of inclusions will find the book to be the most complete bibliography on the subject." This opinion is sufficient to hallmark the bibliography.

As a final example of these specialised bibliographies, of which many might be quoted and analysed, attention should be called to the Bibliography on Corrosion maintained under the direction of Dr. W. H. J. Vernon at the Chemical Research Laboratory, Teddington. This Bibliography contains 36,000 references, with abstracts, and has an author index of approximately 16,000 entries. It is not available in printed form, but can be consulted by the industry. These examples again bring out the large number of Papers which have already been published on specified subjects, to locate which the investigator must either search through the original literature, an almost impossible undertaking, or sift the classified periodical abstracts, a lesser but yet formidable task. It will be obvious, in the light of these figures, that the specialised bibliography constitutes an advance on the periodical abstracts, and deserves greater attention in the future.

"ALLOYS OF IRON RESEARCH"

Over the last ten years, a series of comprehensive historical and critical reviews of past research on the alloys of iron have been published in the United States. These reviews provide an example of a further stage in the co-ordination of metallurgical literature within a narrow field. The monographs—if books varying from 400 to 800 pages each can be classed as monographs—have been compiled by Alloys of Iron Research of the Engineering Foundation; they present a concise but comprehensive critical summary of research on iron and its alloys as reported in the technical literature of the world since 1890. They contain a discussion of all available data on binary and more complex ferrous alloy systems, and on the effect of the alloying elements on carbon steel and on simple and complex alloy steels and special alloy cast irons. They provide a reliable foundation for further research and supply to the practical metallurgist, steelworker, foundryman and engineer, the essential information now scattered through more than 2,000 journals and textbooks in many languages. Where possible, the information has been supplemented by unpublished data, and discrepancies and gaps in existing knowledge are indicated.

Of the 14 volumes planned, eleven have been issued covering 5,635 pages, 1,957 illustrations and 1,175 tables. Reviewing the last volume published, that on high-chromium alloys, in 1940, J. M. Robertson summarises some valuable views on the subject of the co-ordination of metallurgical literature. He writes: "In reviewing the published information, 20,000 Papers have been consulted and 6,218 references have been included in the various bibliographies. The preparation of these monographs has been a substantial contribution to the advancement of metallurgical science. A science of this kind develops by the gradual piecing together of information from numerous sources, and the initiation of researches to fill in the blanks. When the literature on a given branch of the science extends to 20,000 Papers, it becomes impossible for individuals to review the subject for their own edification, and it is only logical that some organised effort should be made to do this once and for all. It is unfortunate that work of this kind cannot be done more frequently."

The points to which attention should be called are: (*a*) The wealth of literature available; (*b*) less than one-third of the Papers published were considered worthy of inclusion; (*c*) there is an urgent need for similar work in other fields; (*d*) such surveys must be periodical to keep abreast with recent developments. In considering the number of Papers dealt with, it may be noted that the patent literature was excluded.

PERIODICAL SURVEYS

As indicated immediately above, a difficulty in co-ordinating metallurgical information is the steady expansion in the literature and the absence of any finality. New instruments of research and new aspects of investigation continually appear, each giving rise to a further spate of literature. A critical survey is no sooner published than it starts to become out of date, under the impact of new knowledge. This hiatus may be filled by the publication of periodical surveys at intervals of two, three or more years, in which experts summarise the progress made since the previous publication, each survey being devoted to a special branch of study.

No comprehensive use has apparently yet been made of this form of survey in any metallurgical field, at least by the technical societies within whose scope the preparation of such reports would naturally fall. The success which has attended such surveys as issued by the Society of Chemical Industry with its annual "Reports of the Progress of Applied Chemistry," whose volume 25 for 1940 contained, *inter alia*, a report on non-ferrous metals by A. R. Powell, by the Institute of Petroleum and by the Institution of Electrical Engineers, to mention but three, sufficiently demonstrates their value. Technologists and professional men could keep up to date with advances in their special subjects, while all would welcome an opportunity to study an authoritative survey of an associated field. It would seem worth while for ferrous and non-ferrous bodies on both sides of the Atlantic to consider the introduction of a scheme on these lines to cope with the growing volume of metallurgical literature and the need for bringing it to the notice of the maximum number of readers.

THE PROBLEM OF IMPROVED DIFFUSION

While the above elements in the co-ordination and classification of the technical literature represent a progressive concentration of the mass of published material to a more assimilable size, the serious worker can in many cases employ these epitomes merely as signposts to the original Papers and contributions, and for the more complete study of a subject must have direct access to the originals. However good an abstract—and nearly all the abstracts of the metallurgical literature are uniformly good and carry the essentials of the original—the abstract cannot replace the original. Since access to the original can only be obtained by actual possession of the periodical concerned or through a library, readers who cannot avail themselves of either of these facilities are prevented from making a closer study of the originals. While many society libraries lend books to their members, it is patently an expensive and difficult procedure to obtain a large number of these on loan, especially if a bulky volume contains a single short article, possibly found useless, when consulted.

Regarded from any angle—and many will suggest themselves—direct access to an original contribution solely by reference to the actual volume, limits the extent to which the originals can be consulted and must, in consequence, hamper the free circulation of information. Only a relatively small number of readers enjoy full access to all the literature they require. Much good work which could be done has been left undone owing to the inability to carry out the essential *a priori* study of the literature. It is evident that further attention must be given to means likely to increase the diffusion of original Papers.

An established method of obtaining access to the original literature has been through photostat or photoprint copies, which are obtained in slightly reduced sizes, yet still easily legible, in either positives or negatives. One important technical library in London supplies negatives at the rate of 6d. per page and positives at 1s. per page. To comply with the Copyright Act, an undertaking must be given that the reproductions are required for study and reference only, and not for further reproduction. The disadvantages of the photostat copy are its bulk and cost; each page of the original requires a complete photostat sheet, reproduction being on one side only, and a large number of sheets make up a substantial weight, not too easy to accommodate and control where, say, 1,000 pages have to be reproduced and studied, a small number for a normal study of the literature on any important subject. The cost question is self-evident since 1,000 negative photostats cost £25, much of which would be expended for useless material.

The Microfilm

The solution of the problem of creating and maintaining the widest possible diffusion of original scientific literature appears to be offered by the microfilm, *i.e.*, the reproduction of the printed pages as very much reduced

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negatives on 35-mm. or 16-mm. non-inflammable films, which may be stored either in long rolls or cut into short strips. The space reduction is claimed to be less than 5 per cent. (and even 1 per cent.) of the space occupied by the originals, and 1,600 pages (or the whole of the editorial in four volumes of the "Foundry Trade Journal") can be reproduced on a 100-ft. length of film of the standard type. For viewing or reading, the films are enlarged in a suitable viewing apparatus or reader.

Extensive use of microfilm technique has been made in many countries for copying documents and records, especially where these are exposed to war damage, but their application to the problem of disseminating technical literature has been very limited. The reasons for this lie in the difficulties raised by the Copyright Acts, and in the lack of an organised service for such literature, by which alone the cost of reproduction can be brought within the range of the average student or research association with limited means.

The only two countries which have organised a proper service for the reproduction of learned literature appear to be the United States and France. In Great Britain, discussions have been proceeding for some time, and while in practice no more difficulty should arise with regard to the copyright laws than is the case with photoprints, no substantial headway appears to have been made as yet. The reproduction of documents and records is still expensive in this country, being operated purely on a commercial basis. No information is available of the position in Germany. In the United States, the American Library Association has an agreement with publishers that no action for infringement of copyright shall be taken if any person reproduces a portion of a book or a periodical for the purpose of facilitating study and not for profit. This disposes of the difficulty raised by the copyright laws and has enabled a system of microcopying to be worked out, making it possible for any accredited person to purchase film negatives of articles in transactions and journals.

Comparison of Photoprints and Microfilms

The American Documentation Institute, Washington, has built up a valuable microfilm service operated on a non-profit basis and which copies extracts from books and journals at very low rates. An example of the work of the Institute is the two reproductions [exhibited] as (*a*) photoprint and (*b*) microfilm, of the 48-page article on the mechanism of martensite formation by A. B. Greninger and A. Troiano, from "Metals Technology" of last June. The microfilm has images 1 in. high on 35-mm. film, and the photoprints measure 6 by 8 in., being readable with the unaided eye. A comparison of the sizes is striking, but more striking still is the cost of each reproduction. The complete film costs 69 cents and the photoprints $5.10. over seven times as much. At the rate of 1.45 cents per page a reader could well afford to build up an extensive library of microfilms, covering a wide range of fundamental literature, and find no difficulty in housing them.

In France, the C.N.R.S., which started its Service de Documentation early in 1940, issued, as already indicated, a "Bulletin analytique," with which it proposed to popularise the use of microfilms among technical readers. These microfilms could be obtained, by subscription, of any of the scientific and technical articles abstracted in the Bulletin on giving the reference number. One of the chief aims of the C.N.R.S., a national organisation, was the wider diffusion of technical literature among learned circles in France and Great Britain and their respective empires, since the microfilm service also applied to these overseas countries. The size of the images was 18 by 24 mm. It has not been possible to obtain any of the films or further information of the fate of the scheme, which appears, from the preliminary notices received, to have been very comprehensive. The references in the "Bulletin" were set out suitable for mounting on cards and indexing, the two sizes of cards supplied by the C.N.R.S. being provided with small pockets at the rear for holding 7-page and 10-page strips of microfilm. This arrangement enables references and microfilms to be kept together in a small space.

Cost of Microfilm Reader

The microfilm is not readable without an enlarger, and some criticism of the value of the method has been levelled on the score of the cost of the reading apparatus. One reader made by a reputable firm, and which has been specially designed for microfilm viewing, is, indeed, expensive, costing nearly £40; this may be due to its elaborateness. It magnifies 35-mm. film twelve times on to a translucent screen, and gives excellent definition; pages can be turned backwards and forwards with a handle, and the apparatus can also be converted to a wall projector for reading by large groups. This model is now no longer available, stocks having been exhausted, and no further imports are likely from America.

It is understood that another firm is planning to produce a much cheaper model in this country, but progress may probably be held up until the end of the war. The C.N.R.S., in their notices, state that the microfilm can be viewed with an ordinary photographic enlarger or by one of two special apparatus devised by the Service de Documentation, one being an ordinary magnifying lens and the other an optical projector. It is clearly stated that these apparatus are being produced in series at the lowest possible cost. It would appear, therefore, that active efforts are being made to reduce the cost of the enlarger and that eventually this question should not stand in the way of the general adoption of the microfilm for the wider diffusion of scientific literature by the reproduction of the originals.

Potentialities of the Microfilm

The potentialities of the microfilm in the sphere of technical and scientific literature would appear to be unlimited. Not only can it much facilitate the wider diffusion of technical articles and Papers, usually in a non-returnable and inexpensive form, but it may also bring about a revolution in library technique and possibilities, by permitting a great increase in the volume of literature which a library can house, without placing a strain on its accommodation. Libraries can be made much more compact by the introduction of the microfilm and as a result become far more comprehensive within a much smaller space. Private libraries, now limited to a few hundred books, could be extended to many thousands of volumes housed in a small cabinet or cupboard of reasonable dimensions. Lastly, the microfilm might even eliminate the need for printing in the case of highly-specialised literature, which circulates among a small circle of experts and students, for reproduction can be made directly from typewritten manuscript.

SUMMARY

The metallurgical periodical Press, which, in the form of the transactions of technical societies and independent journals, contains almost the whole of the original Papers published annually in the metallurgical field, is reviewed, and it is estimated from an analysis of the present range and volume of the principal abstracting media dealing with the metallurgical literature, that there are about 300 to 350 first-line periodicals and probably an additional 150 second-line periodicals serving the ferrous and non-ferrous metallurgical fields, exclusively or in part. These are estimated to contain annually between 3,500 and 4,500 original contributions or good critical reviews. Extensions of the periodical abstracts, realising a further concentration of information, are specialised bibliographies, of which some examples are discussed, and extensive critical reviews of the type of "Alloys of Iron Research." It is suggested that more attention should be given to the increased compilation of these further condensations, as well as to the issue of periodical surveys, in order to effect a wider diffusion of the great wealth of existing and growing knowledge to specialised workers. As a means for the improved diffusion of original Papers and for the expansion of libraries on more comprehensive lines, the microfilm is considered, and is recommended as holding great promise in this direction.

Addendum

The reference to the "Metallurgical Abstracts" of the Institute of Metals on page 178 gives the erroneous impression that the Institute began to publish abstracts only in 1931. Mention should, of course, have been made to the abstracting service which the Institute has provided since 1909. From that year to 1930, the abstracts appeared in the half-yearly issues of the "Journal," with a considerable extension in scope being made after the last war. The only change which took place in 1931 was that the abstracts were issued in the monthly "Journal," instead of half-yearly, and reprinted annually with the title of "Metallurgical Abstracts."

APPENDIX I

Great Britain.—Journal, proceedings and transactions, etc., of the Iron and Steel Institute, the Institute of Metals, the Institution of Mining and Metallurgy, the Institute of British Foundrymen, the Institute of Welding, the British Refractories Research Association, as well as of a variety of local technical societies, such as the Midland Metallurgical Societies, the Birmingham Metallurgical Society, the Staffordshire Iron and Steel Institute, the Manchester Metallurgical Society, the Lincolnshire Iron and Steel Institute, the Newport Metallurgical Society, the Cleveland Institution of Engineers, and the West of Scotland Iron and Steel Institute; the publications of the Electrodepositors' Technical Society and the International Tin Research and Development Council, and a series of independent journals of which the following alphabetical list is representative: Foundry Trade Journal, Iron and Coal Trades Review, Iron and Steel, Light Metals, Metal Industry, Metal Treatment, Metallurgist, Sheet Metal Industries, and Welding Journal.

British Empire.—Canada has Canadian Metals and Metallurgical Industries and the Canadian Mining and Metallurgical Bulletin. South Africa the Journal of the Chemical, Metallurgical and Mining Society of South Africa, the Journal of the South African Institution of Engineers, and The Engineer and Foundryman. Australia is represented by the Proceedings of the Australian Institute of Mining and Metallurgy, and the Australian Institute of Foundrymen, the Australasian Engineer, and the B.H.P. Review. India has the Transactions of the Mining, Geological and Metallurgical Institute of India, and Indian Engineering.

United States.—Proceedings, transactions and bulletins, etc., of the American Society of Metals, the American Institute of Mining and Metallurgical Engineers, the Association of Iron and Steel Engineers, the American Society for Testing Materials, the American Foundrymen's Association, the American Welding Society, the American Electroplaters' Society, and the American Refractories Institute, and such outstanding journals as Blast Furnace and Steel Plant, Iron Age, Steel, Iron and Steel Engineer, Heat Treating and Forging, Chemical and Metallurgical Engineering, Metals Technology, Metals and Alloys, Alloy Metals Review, Metal Progress, The Foundry, American Foundrymen, Metal Industry (New York), Metal Finishing, Wire Industry, Wire and Wire Products, and American Metal Market.

Germany.—Stahl und Eisen, Archiv für das Eisenhüttenwesen, Mitteilungen aus dem Kaiser-Wilhelm-Institut für Eisenforschung, Die Giesserei, Giessereipraxis, Metall und Erz, Metallwirtschaft, Zeitschrift für Metallkunde, Korrosion und Metallschutz, Drahtwelt, Kaltwalzwelt, Aluminium, Alu-

(*Concluded on page* 194.)

Reclaiming Metal Scrap from Floor Sweepings

Reclamation of metal from floor sweepings, furnace skimmings, cores, splashings and slag by a process that turns out a concentrate containing 65 to 70 per cent. usable metallic content is a very practical and economical procedure at the non-ferrous foundry and reclamation plant of the Westinghouse Electric & Manufacturing Company at Linhart, Pa., says W. A. Phair in "The Iron Age." This salvage operation, which converts close to 10 per cent. of all the material charged into it to a reusable metal, represents not only a successful answer to a separation problem which has long perplexed industry, but is sufficiently thorough to make the salvaging operations economically self-supporting.

Gates, risers, pigs and other large chunks of scrap metal are salvaged by the usual methods at Linhart. This article deals only with the reclamation of the very small particles of metal found in slag, sweepings, cores, furnace skimmings and kindred materials. The essence of the Linhart technique is that of water concentrating, with the separation effected by the differences in the specific gravity of the metallic and non-metallic contents of the source material.

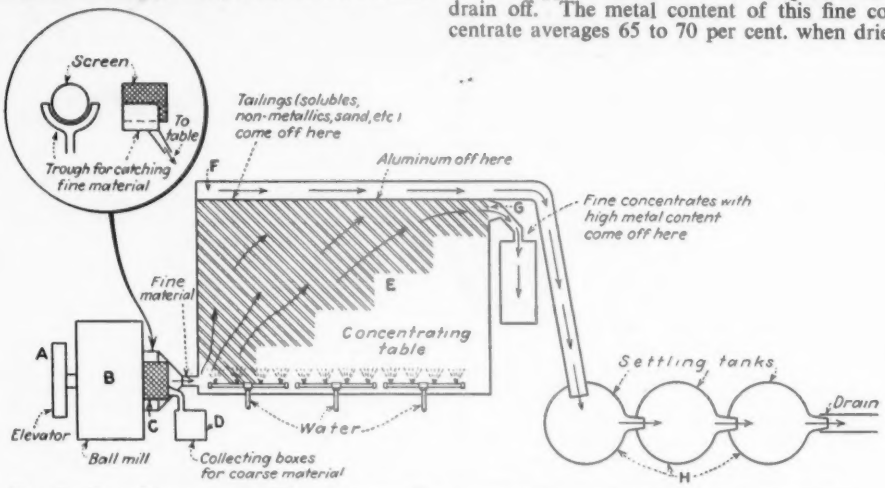

FIG. 1.—PLAN VIEW OF THE WESTINGHOUSE RECLAMATION UNIT. (PLACEMENT OF RIFFLES NOT ACCURATE IN SKETCH.)

Fig. 1 shows the layout and components of the reclamation unit. The ball mill is a standard Marcy unit, while the concentrating table is a regular product of the Deister Concentrating Company, except that the riffles (the small oblique cross bars which interrupt the flow of the material across the table) have been relocated.

The course taken by the source material is, briefly, as follows: It is charged into the vertical belt conveyor (A, Fig. 1) at floor level and raised and emptied into the ball mill (B). There slag and other lumps are reduced in size and some separation of the metal is performed as the crushing of the lumps releases some of the metal imbedded in the larger chunks of slag, etc. From the ball mill the material works out the exit (C) where it passes over a screen which separates it into fine and coarse material.

The coarse material, which consists of fairly large pieces of metal which cannot be broken in the mill, and which is about 70 to 75 per cent. rich in metallics, passes directly into a hopper (D), ready for the refining furnace. The finer material, which, as it leaves the mill, contains a very heavy portion of such non-metallics as sand, slag, etc., runs on to the concentrating table (E).

This table has the usual eccentric motion, with a stream of water, originating at the higher side, playing across its face. The response of the material to the forces set up by the movement of the table have a direct relationship to the specific gravity of the various components of the material. The lighter materials are enabled to progressively hurdle the riffles, while the heavier material (sand and other non-metallics) being unable to cross the table, are washed down the length of the riffles by the water.

Thus, the lighter solubles and non-metallics pass off the table at the end nearest the ball mill (F), while the solubles go directly over the riffles in the stream. The progressively heavier non-metallics leave in the order of their specific gravity along the entire length of the table. The heavier, metallic particles pass off at the far end in a separate channel (G).

Two separate exits from the table are provided, one a gutter running the length of the table which handles the light non-metallics and solubles, and a second at (G), over which the usable metallics move. The average metallic content of the tailings (non-metallic particles and the aluminium-containing material together) is between 0.1 and 0.2 per cent.

Three Settling Tanks Used

The non-metallics are led into three settling tanks (H), while metallics are carried directly into a hopper where the water is permitted to drain off. The metal content of this fine concentrate averages 65 to 70 per cent. when dried. The average analysis of the metal content of this concentrate runs 2 to 3 per cent. Pb, 2 to 3 per cent. Sn, 10 to 12 per cent. Zn, 1 per cent. impurities, balance Cu. Three settling tanks are used at Linhart for convenience in handling. The material ending in these tanks is transported in buckets to the dump heap.

Between 3 and 4 tons of material, wholly generated within the Linhart foundry, can be fed into this unit daily, with from 5 to 10 per cent., by weight, resulting in reclaimed metal. This percentage of returns has proved to be sufficiently high to make the effort economically self-supporting. The fine and coarse concentrates are held until approximately 45 tons is collected. It is then charged loosely into an open hearth, refined, and cast into 80-lb. ingots.

As these concentrates originate wholly within the plant, it is possible for experienced operators to forecast very closely the analysis of the ingot, a factor which tends to simplify manipulations of the refining operation.

The Linhart plant, in addition to reclaiming the sweepings, does considerable work reclaiming scrap for other divisions of the Westinghouse Company. Its practice here, however, follows the general technique used for this purpose. In the reclamation unit at Linhart, more than 450 tons of various metals are handled each month. Much of this total requires no processing, but merely proper segregation in order that it re-enter the scheme to the best economic advantage.

Microstructural Characteristics of High-Purity Alloys of Iron and Carbon

In Research Paper No. RP1403, issued by the National Bureau of Standards, Vol. 27, of the Journal, Mr. Thomas G. Digges has summarised his conclusions on the microstructural characteristics of high-purity alloys of iron and carbon in the following terms:—

Seventeen irons, varying in degrees of purity, were carburised in a mixture of hydrogen and benzene vapour at 926 deg. C. for 3 hrs. followed by cooling in this atmosphere through the transformation range at 2.2 deg. C. per min. The time at the carburising temperature was sufficient to produce hypereutectoid zones in all of the irons.

The presence of free ferrite in the hypereutectoid zones is characteristic of the structures obtained in irons of very high purity under these conditions. As the amounts of impurities in the irons are increased, the final structures obtained after carburising may or may not contain free ferrite in the hypereutectoid zone, depending upon whether the added impurities are of the type which increase or decrease the reaction rate of austenite or the diffusivity of carbon in the Ar_1 transformation range. Difference in oxygen content from about 0.001 to 0.007 per cent. could not be correlated with the amount of free ferrite in the final structure of the alloys. Some of the irons represent a close approximation to oxygen-free material. The precise role of oxygen in the development of ferrite in the final structure is not entirely clear. However, if oxygen were responsible for this structural feature in the hypereutectoid alloys of highest purity, then a minute amount was sufficient and as effective as larger amounts.

The carburised structures of all the irons which were free from aluminium contained free ferrite. Aluminium in excess of about 0.001 per cent. inhibits the formation of free ferrite in the hypereutectoid zone, and alumina was not the factor responsible for its formation.

The presence of hydrogen in the carburising and annealing atmospheres had no detectable effect on the formation of free ferrite.

Free ferrite was not detected in the eutectoid zone of any of the alloys. However, variations might exist in amounts of proeutectoid carbide without markedly affecting the formation of free ferrite on slowly cooling from the austenitic condition.

Free ferrite in hypereutectoid alloys was produced with equal facility either by cooling directly from the carburising temperature or by annealing *in vacuo*. The initial structures of the irons, either as cast or after working, had no effect on the formation of free ferrite in the final structures.

The average grain size established in carburising the various irons at 926 deg. C. ranged from American Society for Testing Materials grain number 4 to − 1, but there existed no correlation between austenitic grain size and the formation of free ferrite. A noteworthy feature was the large austenitic grains of the alloys of highest purity which contained relatively large amounts of free ferrite.

Canadian Iron and Steel

Immediately following Japan's declaration of war, Canada took immediate steps to expand still further its war production programme. The drawback to a record expansion of production facilities is the shortage of steel, for on December estimates supplies for 1942 would be 2,000,000 tons short of requirements, in spite of further curtailment in civilian-steel allocations. Production of steel ingots and steel castings in the first ten months of 1941 amounted to 1,971,909 tons, an increase of 19.5 per cent. over the total of 1,649,639 tons made in the corresponding period of 1940. Production of pig-iron in the same period was 1,082,222 tons, against 948,841 tons in the parallel period of 1940.

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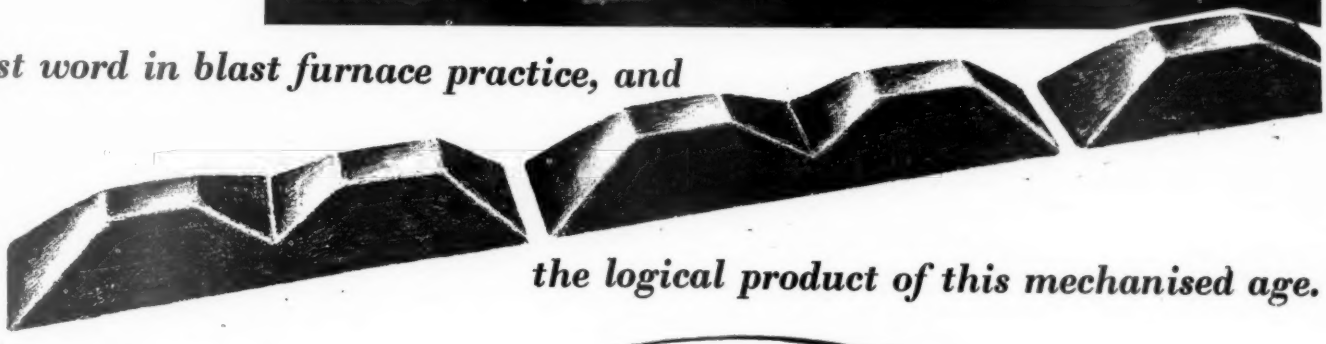

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American Metallurgical Scene—7

Tasks of American Steel Industry

In his annual review, Mr. Walter S. Tower, President, American Iron and Steel Institute, says that for the steel industry, 1941 was a year of historic accomplishment. Under the impetus of the approaching war emergency, American steel companies produced over 82,800,000 net tons of steel, or approximately 25 per cent. more than had ever before been made in one year. The previous record was 67,000,000 tons in 1940.

The record achieved in 1941 stands out in its full stature against the background of recurring strikes and slow-downs in coal mines and steel plants, and of shortages which developed in certain raw materials, such as scrap steel. Those developments beyond any doubt caused a loss in production toward, if not beyond, a million tons of steel. In the face of these handicaps, it may fairly be said that the steel industry accomplished an extraordinary feat of production.

The outbreak of the war with the Axis countries found the steel industry of the United States fully prepared, and ready to do whatever is necessary to assure ultimate victory. The industry had been functioning for many months on the basis of a 24-hour day and a seven-day week. Its leaders had long ago accepted as their primary task the fulfilment of all defence needs, as long as the country's security and freedom are threatened by hostile nations. For those reasons, the steel industry has quickly and smoothly placed itself on a wartime basis.

The war of the Pacific is of direct concern to the steel industry because of the threat to the lines of supply of strategic metals, such as tin, chrome ore and tungsten, from the Far East. Developments in these areas make necessary the strictest conservation of strategic metals. By assuring enough steel for the manufacture of military and defence equipment during 1941, the steel industry made one of the most essential of all contributions by industry to national security, and the war effort which the United States now faces.

Probable War Needs

Exactly what the war needs for steel have been or will be cannot be answered by any data available. In the closing months of 1941, reports from steel companies indicated that somewhat less than one-third of all their shipments were going under A-priority rating to the Army, the Navy, to other Government agencies and to Lend-Lease. Another one-third of total shipments went to non-Government consumers holding A-priority ratings.

While two-thirds of the steel shipped to consumers at the end of 1941 bore an A-priority, it would not be correct to assume that defence needs represented that large share of the tonnage shipped. Many regular, peacetime buyers of steel, such as the railroad industry, the steel warehouses, farm equipment, and others have been assigned an A-priority rating although a very large part of their steel requirements are destined primarily for common civilian uses.

It had been estimated in some official quarters prior to the declaration of war that the 1942 steel consumption of the Army, Navy, Maritime Commission and the Lend-Lease Administration would be in the neighbourhood of 17,000,000 tons. America's productive capacity, at the beginning of 1942, stood at approximately 88,000,000 net tons. That would certainly leave a very large tonnage of steel available for indirect defence and civilian needs, but how greatly the total will be affected by active warfare is still not clear.

Plant Expansions

The foresight of leaders of the steel industry in expanding steelmaking capacity by 15,000,000 tons, or 20 per cent., since 1929 has proved invaluable during the defence emergency and will have incalculable importance as the war progresses.

According to plans already accepted, steel capacity is currently being expanded still further to over 90,000,000 tons annually. It is apparent, however, that such an amount of steel capacity cannot be fully employed until some time in 1944, because of shortage in supply of scrap steel, the need for more blast furnaces to compensate for that shortage, and for facilities for transporting from the mines to the blast furnaces the greatly increased tonnages of iron ore that will be required.

The new blast-furnace capacity now under way was designed to supply pig-iron for the steel capacity now existing or planned. It would not provide pig-iron for any substantial further addition to steelmaking capacity beyond what is now in prospect.

Full Co-operation for Defence

Full co-operation with the defence programme since its inception has been the basic policy of the steel industry. From the middle of 1940 until the summer of 1941, the steel industry voluntarily gave priority to defence orders. Then a system of mandatory priorities was established by the Office of Production Management. All present indications are that specific allocations of materials will replace priorities. This would place the distribution of steel on a more effective basis, with no more chances for the accumulation of "priorities inventories."

As buying and inventories are brought under better control in 1942, it seems logical to expect a more normal condition in supplies and deliveries of steel. If carefully controlled allocations replace blanket priorities, swollen inventories may diminish and duplication of orders may be discouraged. Furthermore, it is likely that, as long as the war lasts, a progressive let-down may be expected from the heavy buying of consumers' goods, which prevailed during much of 1941. Higher taxes will be a factor in such curtailment, and in addition it is unlikely that the output of many consumers' goods could be greatly expanded owing to shortages, created by defence needs, in non-ferrous metals, chemicals, machine tools, and skilled labour.

Despite the heavy demands, first of the defence programme and later for war, the amount of steel available for some leading non-defence uses in 1941 probably came close to record levels, reflecting the heavy production of automobiles, refrigerators and similar consumers' goods, particularly during the first nine months of the year. While sacrifices and substitutions among non-defence steel consumers may be necessary in 1942, particularly in alloy steels, the steel industry in 1942 will make millions of tons above the maximum of all defence or war needs.

Recent American Steel Foundry Developments

Henry D. Phillips, of the Lebanon Steel Foundry Company, read a Paper on "Significant Developments in the Steel Foundry Industry during Recent Years," at the February meeting of the American Foundrymen's Association, held at the Essex House, Newark, N.J. He listed seven factors as contributory to the rapid strides in the improvement of steel castings. Scientific control in steelmaking, such as the viscosity and density tests now performed on slag, ensure a better grade of steel. The new developments and better control have brought acid converter steels back into the picture with properties heretofore unattainable. Room temperature and high-temperature tests of cores have shown the advantages of additions, such as basic oxides as secondary binders to prevent high-temperature cracking of cores and subsequent veining in the casting, pointed out Mr. Phillips. Directional solidification research, started by Briggs and Gezelius, has probably been the largest contributing factor to sounder castings. The importance of this knowledge in pattern design cannot be over-estimated. Radiographic and magnetic inspection, aside from being a non-destructive test for the customer, have also been an invaluable aid to the foundrymen for studying the effects of different casting procedures. Welding, heat-treatment and a scientific production programme all contribute to good economical steel castings which to-day, through the elimination of guess-work and the adaptation of the forementioned developments, are finding ever-broadening applications, concluded the speaker.

Iron-ore Mines in the United States

A large increase in employment and an accompanying increase in the accident-frequency rate per million man-hours worked in 1940 were the main facts revealed by reports from iron-ore mining companies to the Bureau of Mines. The industry as a whole employed 22,585 men for an average of 242 workdays per man. The number of man-hours worked increased by more than 8 million man-hours to 43 million. As a result of accidents in and about the mines, 35 employees were killed and 838 employees were injured in 1940, a fatality rate of 0.80 per million man-hours worked, compared with 0.64 in 1939, and a non-fatal injury rate of 19.13, compared with 16.87.

American Prices for Non-Ferrous Castings

The United States Office of Price Administration has asked foundries not to charge prices higher than those prevailing between October 1 to 15, 1941, on their output of non-ferrous castings. Prices for these castings have risen about 20 per cent. on the average during 1941. The upward trend has been accelerated in recent months and prices are now somewhat higher than those prevailing in October, even though, for many months, the prices of the principal raw materials going into non-ferrous castings have been stabilised. To facilitate an analysis of prices in order to fix stabilised prices, foundries have been asked to give details of sales, costs and profits.

Detecting Cracks in Crankshafts

Magnetic crankshaft testing at the General Electric Company's works in Schenectady consists of magnetising the shaft, making the direction of the flux longitudinal so that it will intercept any possible cracks at right angles. While magnetised, the shaft is sprayed with kerosene carrying in suspension finely divided particles of magnetic iron oxide. The test is made each time a shaft is removed from a punch press because the former is subjected to tremendous strain in service. One large company recently examined a group of 43 crankshafts in this way and found that 14 of them were cracked and required replacement.

Tin Substitute in Bronze Castings

Increased production of a metal that will effect a substantial saving in the use of tin is reported by Phelps Dodge Copper Products Corporation, New York. This product, P-M-G Hardener, can be used in place of tin in production of bronze castings, and is said to produce a good casting at no greater cost. The product is already being used by the Navy and by private shipbuilders in very large tonnages according to the report. It is said to be exceptionally valuable in the manufacture of valves, pump bodies, impellers, flanges, valve trims and other type castings, including projectile hoists and gun mounts.

U.S. Pacts with Latin America

The Metals Reserve Company has concluded agreements with Mexico and Brazil to acquire strategic and critical materials. An agreement with Peru is near completion and similar pacts with Chile and Argentina are being negotiated. The primary purpose of these arrangements is to prevent such materials from going to the Axis powers, particularly to Japan or through that country to Germany. Contracts had been negotiated for 1,300,000 tons of foreign manganese ore.

Up to November 30, 1,361,492 tons of iron and steel and 63,012 tons of non-ferrous metals have been transferred under lend-lease aid.

The cast-steel turrets of the 28-ton Chrysler M-3 tanks weigh 4,000 lbs. apiece. Turrets of the 60-ton heavy combat tank are also of cast steel.

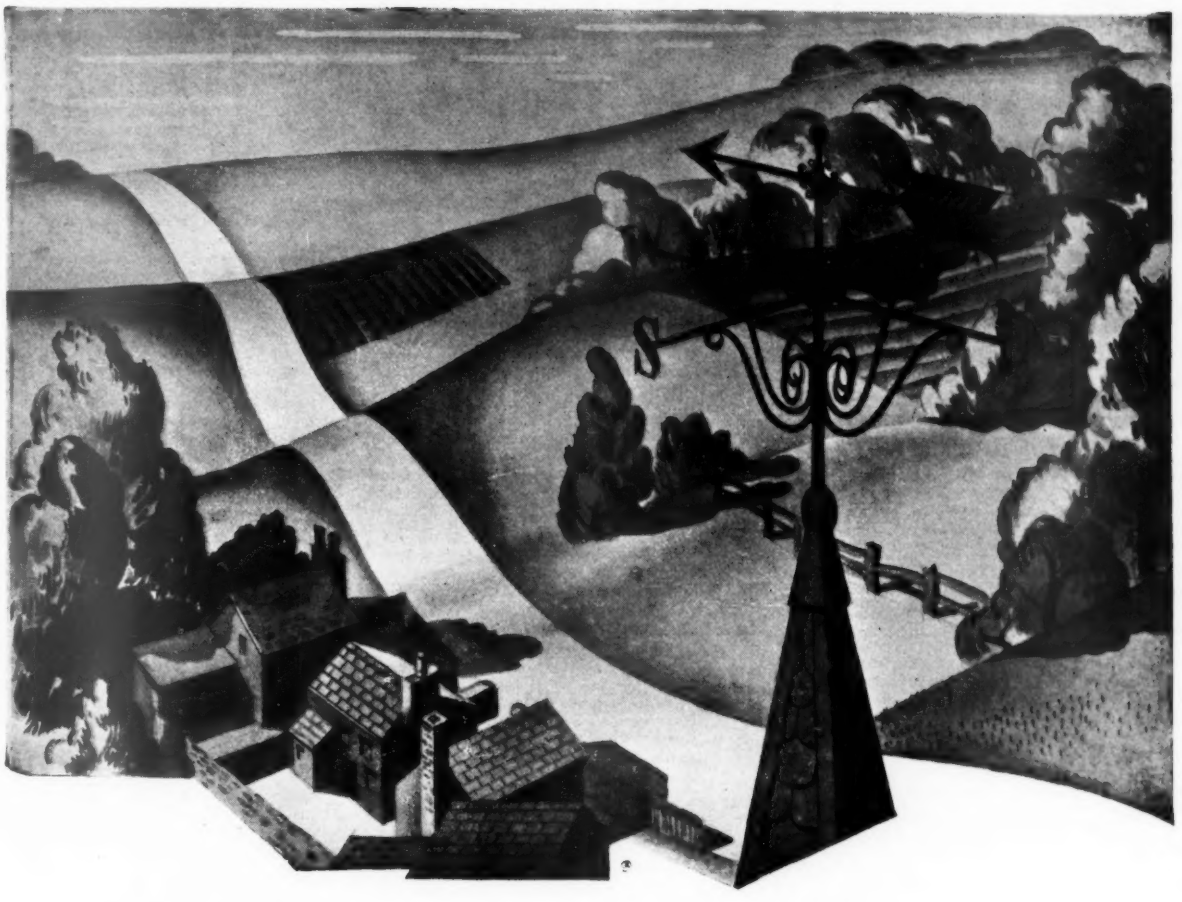
The National Tube Company, a subsidiary of the U.S. Steel Corporation, has signed the first contract in the history of the steel industry affecting salaried employees.

The American Rolling Mill Company, of Middletown, Ohio, is to build plant with an annual capacity of 600,000 tons at Ashland, Ky., for the production of synthetic scrap.

Shipbuilding plants in the United States as of December 1 held orders for 1,135 vessels with an aggregate tonnage of 6,780,530 gross tons, states the American Bureau of Shipping.

Owing to the heavy demand for copper from the United States, Chilean mines are now producing 40,000 tons per month, establishing a new record. Peruvian mines are also working to capacity.

Bethlehem Steel Corporation in 1941 produced an all-time record of 12,155,476 net tons of steel ingots, as compared with the prior record in 1940 of 10,704,741 net tons, when capacity was rated at 11,850,000 tons per year. December had the biggest single month's production in the history of the company at 1,067,499 net tons, compared with 1,054,261 in October, 1941, the previous record.



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W 59

The Week's News in Brief

Trade Talk

THE NEWMAN ENGINEERING, LIMITED, 6, Empire Way, Wembley, Middlesex, is being wound up under a High Court Order.

NET PROFIT of the International Nickel Company of Canada, Limited, and its subsidiaries for 1941 totalled U.S.$34,356,401, compared with $35,544,772 for 1940.

A SCOTTISH SHIPBUILDING YARD has established an output record by exceeding its programme for the past 12 months by 40 per cent. Another yard has maintained a 60-hr. week for two years, and has been turning out repair jobs in quick time.

UNDER A NEW ORDER issued by the Ministry of Supply, anyone wishing to acquire a used machine tool the price of which exceeds £50 must obtain a licence from the Machine Tool Control, and no one may dispose of a used machine tool except to a person who can produce such a licence or to an authorised dealer.

A MOBILE CANTEEN, presented by the employees of Babcock & Wilcox Tube Company, Beaver Falls, U.S.A., was handed over to the Glasgow Y.M.C.A. on March 14 at the Renfrew works of Babcock & Wilcox, Limited. A cheque for £250, raised by the Renfrew, Dumbarton, and London branches of the firm, was also presented towards the upkeep of the canteen.

MORE THAN 500 WOMEN are employed in the Scottish iron and steel industries at wages and conditions approved by the Iron and Steel Trades Confederation and the employers. The number will be increased to 10 per cent. of the total personnel. The women are engaged as labourers, crane-drivers, donkey-engine operators, platelayers and in general jobs.

THE MINISTRY OF LABOUR, in a circular on the employment of foreign nationals on munitions in Britain, says that the apprehension of British workers when these workers are German or Austrian is "quite understandable, but foreign workers are carefully considered by the security services before permission is granted for their employment in the main war industries."

THE ASSOCIATION OF CHAMBERS OF COMMERCE has issued a memorandum containing a number of suggestions relating to cost investigation and price fixing in connection with Government contracts. The principal reform suggested is that contracts should be placed on a "fixed-price" basis wherever possible, with a standard "rise-and-fall" clause where appropriate. The "cost-plus" method of price fixing is criticised on the grounds that it leads to inefficiency. The memorandum points out that contractors are as anxious as the Departments to speed the war effort, and they would feel that they were being permitted to do their share and would answer the responsibility entrusted to them if they were treated more in the spirit of partners and less as unreliable employees who should be controlled by contracts which can only be revised downwards and by irritating post accounting.

THE ADJOURNED ANNUAL GENERAL MEETING of Dorman, Long & Company, Limited, will be held in London to-day. In a statement circulated to shareholders in advance of the meeting, Viscount Greenwood, P.C., the chairman, states that adverse conditions outside the company's control continued throughout the twelve months, and, as a result, the trading profits are not commensurate with the volume and value of the work done by the various departments. The directors are unable to recommend dividends either on the preferred ordinary or the ordinary share capital. It is estimated that, as matters now stand, the total cost to the company to September 30, 1941, under the provisions of the War Damage Act, 1941, may amount to as much as £220,000. It is hoped, says Viscount Greenwood, that the Government may see their way to give the iron and steel industry more equitable treatment. Iron and steel producers are required under the legislation passed in March, 1941, to make payments on a very different footing from public-utility companies, and if the experience now available is taken into consideration, together with the effect of such large payments on the liquid position of concerns in the iron and steel industry, suitable adjustments may be provided for in the War Damage (Amendment) Bill now being drafted. In the meantime, the directors have transferred from profit and loss account to general reserve £100,000 to cover the cash withdrawn from the company's working capital in payment of War Damage Contributions and premiums during the past year.

Obituary

MR. HARRY LOWE, chairman of Lowe & Brookes, Limited, malleable ironfounders, Blackheath, Staffs, died on March 10.

MR. HENRY MACPHERSON, formerly assistant managing director of the Wellington Foundry, Leeds, has died, aged 72.

MR. HERBERT JAMES BUBB, who was associated with the Aluminium Castings Company, Limited, Greenock, died at Kilmacolm on March 10.

MR. GEORGE W. TAYLOR died on March 17 in a Birmingham nursing home, at the age of 67. He had for the past 15 years been a sales representative of Bradley & Foster, Limited, Darlaston. During this period he made many friends in the foundry trade. Previously he had been connected with Wolseley Motors, Limited.

MR. N. E. TERSERUS, a well-known figure in the Swedish iron and steel trade, died at Sheffield recently. He began his career with George Senior & Sons, Limited, and later represented a Swedish steelworks. For the last three years he was consultant to A. Johnson & Company (London), Limited.

MR. JAMES C. STUART, the constructional engineer, has died in New York. His large-scale buildings are known all over the world. In America his work included the Westinghouse Electric Works and the Carnegie steel mills at Pittsburgh, the New York Central Railway, and the Wall Street Tower. In Britain he reconstructed the tunnels under the Mersey River and built a considerable part of the London Underground Railway system and the Clyde Valley Electric Works.

Personal

MR. E. H. PAYTON has been elected chairman of Drakes, Limited, gas engineers and ironfounders, of Halifax.

MR. J. MARTIN BAXTER has been elected a director of P. & W. Maclellan, Limited, engineers, etc., of Glasgow.

LORD MOTTISTONE has been installed as president of the Institute of Marine Engineers in succession to Sir Percy Bates.

MR. N. G. CALDER, chief engineer of Thomas E. Gray & Company, Limited, and MR. L. N. WILSON, secretary of that firm, have resigned their respective positions.

MR. R. A. BUTLER, President of the Board of Education, is the new chairman of the Scientific Advisory and Engineering Advisory Committees in succession to Lork Hankey.

COLONEL S. J. THOMPSON, D.S.O., has been elected president of the Institution of Mechanical Engineers, succeeding Mr. W. A. Stanier. Engineer Vice-Admiral Sir George Preece, K.C.B., and Mr. Harry R. Ricardo, B.A., F.R.S., have been elected vice-presidents. Dr. H. L. Guy, F.R.S., has been appointed sceretary.

Contracts Open

Armagh, March 31—Cast-iron pipes, lead pipes, etc., for 12 months from April 1, for the Urban District Council. Mr. V. M. Conran, town clerk, Armagh.

Glasgow, April 22—Chilled-iron brake blocks, for the Corporation Transport Department. The General Manager, 46, Bath Street, Glasgow.

Manchester, April 6—Iron castings, for the Cleansing Committee of the Manchester Corporation. Mr. Bertram B. Jones, director of public cleansing, Town Hall, Manchester, 2.

Newcastle-under-Lyme, April 11—Cold-blast slag, castings, etc., for the year ending March 31, 1943, for the Borough Council. The Borough Surveyor, Lancaster Buildings, Newcastle, Staffs.

Widnes, March 31—Approx. 1,350 yds. of 18 in. dia. cast-iron concrete-lined Class "B" water pipes, with approx. 6 tons of special castings, for the Corporation Gas and Water Department. Mr. James Wallace, town clerk, Town Hall, Widnes.

Reports and Dividends

(Figures in brackets refer to the previous financial year.)

Fleming & Ferguson—Interim dividend of 1s. per share.

Bruntons (Musselburgh)—Dividend of 20% (same).

Heenan & Froude—Interim dividend of 5% (same).

Wolverhampton Die-Casting—Interim dividend of 5% (same).

Blakey's Boot Protectors—Interim dividend of 7½% (same).

Thompson Bros. (Bilston)—Interim dividend of 7½% (same).

Radiation—Net profit for 1941, after tax, £130,432 (£117,969); ordinary dividend of 6% (same).

Associated Electrical Industries—Dividend of 10% on the ordinary shares for 1941 (same).

Hadfields—Final dividend on the ordinary shares of 15% (same), making 22½% (same) for 1941.

Telegraph Construction & Maintenance—Net profit, £50,875 (£47,569); dividend of 10% (same).

Wallsend Slipway & Engineering—Final dividend of 8%, making 15% (same), and a bonus of 7% (same).

Blythe Colour Works—Net profit for 1941, before tax, £28,280 (£18,679); ordinary dividend of 5% (same).

Swan, Hunter & Wigham Richardson—Final dividend of 6% (same), making 10% (same) on the ordinary stock.

Watford Electric & Manufacturing—Second interim dividend on the ordinary shares of 10% (same), making 15% (same).

G. D. Peters & Company—Net profit for 1941, £54,287, after E.P.T. (£114,901), before £60,000 to tax); dividend of 15% (same).

Thos. Firth & John Brown—Final dividend of 5¼% (6¼%), free of tax, making 10% (12½%), free of tax, on the ordinary shares, for 1941.

J. Brockhouse & Company (Ireland)—Profit for the year ended October 31, £2,290; debit balance brought in written off; credit forward, £408.

Darlington & Simpson Rolling Mills—Dividends on the 5½% first and 6% second cumulative preference shares for the half-year to March 31, 1942.

Hepworth & Grandage—Net profit to September 30 last, after depreciation, tax, etc., £40,394 (£46,823); dividend of 12½% (same); forward, £16,950 (£22,182).

Briggs Motor Bodies—Interim dividend on the ordinary shares of 7%. It is not anticipated that any final dividend will be recommended. (Total dividend, 1940, 7%.)

Midland Electric Manufacturing—Profit for 1941, after tax, £42,022 (£45,441); dividend on the ordinary shares of 10% (same), together with a cash bonus of 15% (same).

Thomas Robinson & Son—Net profit for 1941, £29,396 (£30,828); final ordinary dividend of 5%, making 7½% (5%); forward, after preference dividend, £34,567 (£33,040).

National Gas & Oil Engine—Net profit for 1941, after taxation and war damage contribution, £49,402 (£49,048); ordinary dividend, 5% (same); forward, £24,353 (£26,951).

Rivet Bolt & Nut—Net profit for 1941, after depreciation, £44,889 (£47,547); to reserve, £10,000 (£15,000); employees' benefit, £5,000; dividend of 10% (same), £25,781; forward, £12,866 (£10,660).

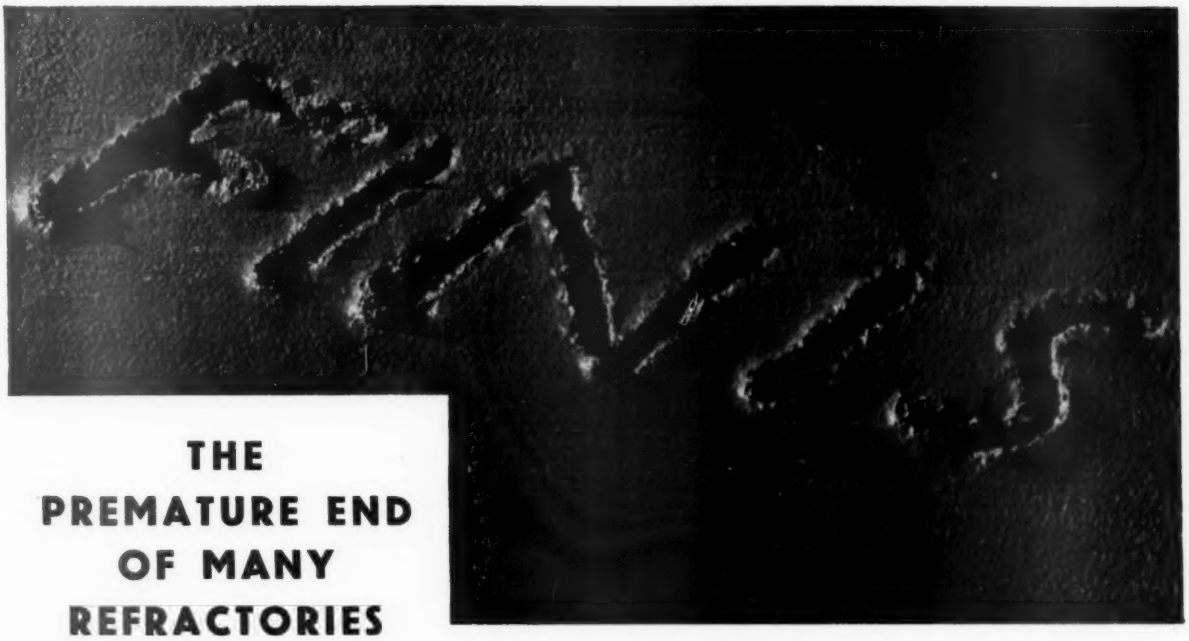
Vickers—Net profit to December 31, after providing for taxation, £908,905 (£1,119,120); to contingencies, £250,000; final ordinary dividend of 6%, making 10% (same); forward, £690,786 (£651,821).

John C. Parkes & Sons—Net profit for 1941, £5,958; interim dividend of 6d. per 15s. ordinary share, £558; debenture interest, £1,434; final dividend of 1s. per share, £1,116; forward, £10,763 (£7,907).

British Rola—Net profit, after tax, for the year to March 31, £12,262 (£12,022 previous 15 months); interim dividend of 1d. per 2s. ordinary share, tax free; final 2d., less tax (no ordinary dividend previous 15 months).

Venner Time Switches—Distribution of 16% on the 8% cumulative preference shares, being in respect of 18 months' dividend arrears to September 30, 1941, and the dividend for the six months to March 31 next.

Lancashire Steel Corporation—Gross earnings for 1941, £1,246,796 (£1,216,274); depreciation, £175,000 (same); plant replacement, £15,000 (£25,000); war damage premium, £57,500 (£40,000); net trading profit, £998,871 (£975,624); taxation, £735,000 (£701,000); staff fund, £5,606 (same); net profit, £258,265 (£269,018); preference dividends, £56,956 (£64,623); ordinary dividend of 7% (same), £121,179 (£139,355); forward, £82,933.



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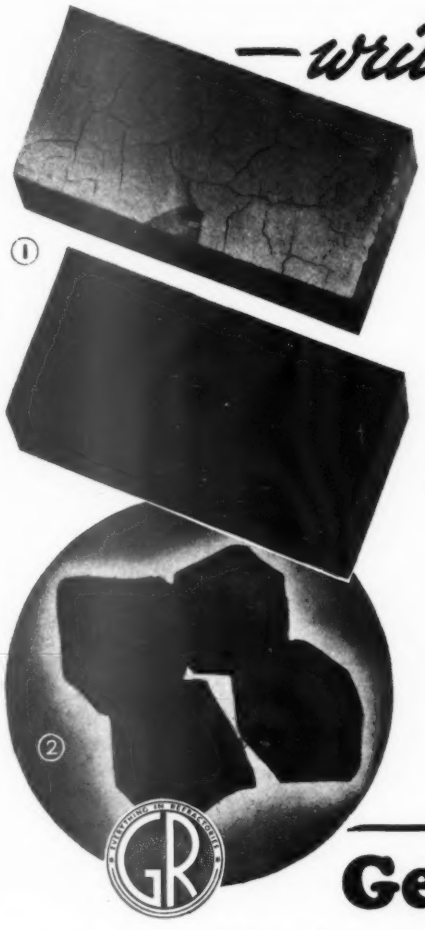

JOINTS ARE THE WEAKEST PART of a furnace lining. The use of ordinary fireclay as a jointing material has certain fundamental disadvantages—it shrinks on drying and again on firing—the bricks do not remain bonded—and fireclay joints are readily attacked by slag. Durax No. 3 Refractory Cement for use with all types of fireclay bricks is a jointing material specially developed to overcome these serious disadvantages. It ensures the thinnest possible joints—sets hard without heat—and does not shrink during drying or firing.

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NO SHRINKAGE. Illustration (1) shows one firebrick coated with fireclay and the other with Durax No. 3. Both were allowed to dry at atmospheric temperature. The results are easily comparable in the photographic reproductions.

STRENGTH. Illustration (2) shows two test pieces allowed to dry at atmospheric temperature, and one fired to 1500°C. Tensile strength results—*Unfired:* 115 lbs. per sq. in. *Fired:* 912 lbs. per sq. in.

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G.P.34

Raw Material Markets

There is a big demand for heavy engineering castings on Government account, and makers' order-books are filled over some months to come. Similar conditions are likely to prevail for the duration of the war, as works in this category are fully harnessed to the war machine, so that there is little scope for the acceptance of orders from ordinary domestic consumers. In some districts reports suggest that makers of light castings have lately been rather better employed, but this section of the trade continues to find difficulty in operating full time, and comparatively few works are satisfactorily placed. Blast furnaces catering for the needs of the steel industry are being called upon to meet an insistent demand, outputs moving away as produced.

Pig-Iron

MIDDLESBROUGH—Medium and heavy castings are fully absorbed, and manufacturers are eagerly accepting delivery of all the iron released to them by the Control authorities. They cannot always get the exact grade they desire, and many makers are utilising large tonnages of ordinary foundry pig-iron, which is much more readily available than better qualities. High-phosphorus iron is usually briskly taken up by the light-castings industry, but consumption in this section is now much below pre-war levels, and is not likely to expand materially until it becomes possible for makers to accept orders for housebuilding requisites or accept overseas business. A certain amount of building is going on for the Government, but nothing like sufficient to provide light-castings works with more than a small proportion of the volume of business usually derived from this source. Heavy engineering establishments for the most part are obtaining satisfactory results despite a substantial cut in their supplies of hematite and other better-quality irons. Basic-iron production is taxed to capacity, and there is no surplus after the requirements of the steel trade have been covered.

LANCASHIRE—Owing to the quietness of most light-castings and jobbing foundries and makers of textile machinery, the movement into consumption of ordinary foundry iron is on the slow side, and the present rate of deliveries from the Midlands is quite satisfactory. Special refined pig-irons, on the other hand, are being called for quite freely, and Lancashire users are placing good orders with producers in the Midlands. The better-quality irons are needed by machine-tool works, heavy-electrical engineers, etc., who are operating to capacity on work of national importance. No easier conditions are reported with regard to deliveries of hematite, which continue to be very restricted.

MIDLANDS—Conditions in the engineering industry in the Midlands remain somewhat variable; makers of heavy castings can take on little business after satisfying the requirements of Government departments, but there is plenty of room for expansion among producers of light castings, where activity is only moderate. Machine-tool makers also are operating briskly, while a number of jobbing foundries are well placed for business. Where possible, foundries are carrying out the wishes of the Control for them to incorporate as much high-phosphorus iron in their mixtures as is compatible with the nature of their work, as this type of iron, being produced from ores located in the United Kingdom, is in ample supply to meet all needs, whereas special qualities of iron are in rather short supply; the latter are manufactured from foreign ores, imports of which have been severely cut down in recent months, chiefly in order to conserve shipping space for even more valuable cargoes. Hematite is especially difficult to procure, and allocations are made only to essential consumers whose needs cannot be met by the use of alternative grades. Refined pig-iron is quite plentiful and is being used extensively.

SCOTLAND—As much high-phosphorus iron as possible is being pressed on engineering works, so that supplies of better-quality irons may be reserved for vital requirements. This type of iron is promptly delivered, as it is made from home ores, and its use has been developed appreciably in the manufacture of heavy castings, etc., since supplies of other descriptions became limited. Heavy engineering works are doing a lot of important business for the Government, and their consumption of iron is in proportion to their activity, while marine engineers are also fully engaged on orders for the Government. There have been further indications of better employment in the light-foundry trade during the past week, and some order-books are closed for the time being, although a number of works have not yet shared in the improved conditions. Adequate tonnages of iron are arriving from makers in the Midlands.

Coke

Transport of foundry coke from the ovens to consuming points is now quite normal, and consumers are well placed for supplies, whether they are under contract over a lengthy period or whether they buy from week to week as in the case of many small users, who rarely have more than meagre stocks on hand. Consumers of large quantities, however, usually keep quite extensive ground stocks, and so cover themselves against delays in transport such as occurred earlier in the year.

Steel

Special and alloy steel makers are enjoying a very brisk demand at the present time, and the full production is being requisitioned for the manufacture of munitions, etc. This is undoubtedly the most active section of the steel industry now, although some other sections are also very busy. Plate mills, for example, are fully committed over some time to come, and there is unlikely to be any recession for the duration of the war. Sheet makers are not quite so briskly employed in many instances, although special qualities of sheets for the manufacture of munitions, aircraft, etc., are still in full request. After existing contracts have been completed there will be no further work for makers of galvanised sheets unless quantities are wanted by Government departments.

Scrap

If there has been any change in the delivery position of iron and steel scrap during the past week it has been favourable, although supplies need to be improved still more before the situation can be described as satisfactory. Good progress is being made with the national scrap collection campaign, but by no means all the metal obtained is the most suitable quality for consumption in the steelworks, for example. Heavy foundry cast-iron scrap is moving away in large tonnages and, on the whole, ironfoundries are able to procure their requirements moderately well.

Metals

COPPER—The copper position may be described as fairly satisfactory, as all essential users are getting every ton of metal needed for their production. It is true that ordinary domestic users are unable to secure more than a fraction of their demands, but that is only to be expected in a world war. Production of luxury goods containing copper has long since been suspended or at least drastically curtailed, so that the large-scale imports of Empire and other supplies of copper are being used up in the manufacture of munitions of war. Copper production in both North and South America is likely to be increased this year, while plans are being made to expand the domestic output of Australian metal.

TIN—Efforts to reduce consumption of tin continue to be strenuously pursued, but the optimum results cannot be obtained immediately, and it will be some time before the use of the metal is confined solely to really important business. In the House of Commons last week Mr. Glanvil Hall asked the Minister of Supply whether he had yet received the report of the Controller of Non-Ferrous Mineral Development on the position of the Cornish tin-mining industry; and, if so, what steps he proposed to take immediately to utilise the resources available, both in open and closed mines. The Joint Parliamentary Secretary to the Ministry of Supply (Mr. Peat) said in reply that it was not intended to await a general formal report on the entire position of the Cornish tin-mining industry. Proposals for specific developments would be considered as they arose. The Ministry of Supply were already in negotiation with the owners of the three principal mines at present in production, with the object of obtaining an increased output, and exploratory and other preliminary work was being undertaken under the direction of the Control at properties not at present producing. The Ministry were helping the three mines already in production in every way they could with labour.

SPELTER—Brassmakers and die-casters continue to absorb very large tonnages of zinc, but activities in the galvanising section are being appreciably curtailed. Consumers engaged on war work are securing ample supplies of spelter, but deliveries to other destinations have been reduced to the minimum.

LEAD—There is little change to report in the lead position in this country. Distribution is now subject to much keener vigilance, but essential users' requirements are met in full and promptly.

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